AFRICAN ECONOMIC RESEARCH CONSORTIUM

Collaborative PhD Programme in Economics for Sub-Saharan Africa

COMPREHENSIVE EXAMINATIONS IN CORE AND ELECTIVE FIELDS
FEBRUARY 14 – MARCH 6, 2018

MICROECONOMICS

Time: 08:00 – 11:00 GMT   **Date: Monday, February 19, 2018**

INSTRUCTIONS:

Answer a total of FOUR questions: ONE question from Section A, ONE question from Section B, and TWO questions from Section C. Please note that Question 5 in Section C is compulsory.

The sections are weighted as indicated on the paper.

SECTION A: (15%)
Answer only ONE Question from this Section

Question 1

(a)   Discuss the cross price elasticity of demand and what its sign implies in terms of the relationship between goods.   **[7.5 marks]**

(b)   Explain why the supply of houses is expected to be more price-inelastic in the short-run than in the long-run.   **[7.5 marks]**

Question 2

(a)   How does an externality give rise to market failure?   **[5 marks]**

(b)   What measures might be undertaken to correct such a market failure?   **[5 marks]**

(c)   Use one of the measures to illustrate how externalities can be corrected.   **[5 marks]**

SECTION B: (25%)

Answer only ONE Question from this Section

Question 3

(a) Derive the expenditure function for a perfect substitute utility function.   [**10 marks**]

(b) Show that the derived expenditure function satisfies homogeneity property and Shephard's

Lemma.   [**5 marks**]

(c) Using your knowledge of Duality and Shephard's Lemma, derive the Slutsky equation.

[**10 marks**]

Question 4

Given a production function $q = L^{\frac{1}{2}} + K^{\frac{1}{2}}$ where L and K are amounts of labour and capital

used in producing q.

(a) Derive the elasticity of substitution for the production function.   [**5 marks**]

(b) Determine the returns to scale of the production function.   [**5 marks**]

Suppose the production function is specified as $q = L^2 K^2$.

(c) Determine the elasticity of substitution of the production function.   [**5 marks**]

(d) Determine the returns to scale of the production function.   [**5 marks**]

(e) Compare the results in (b) and (d).   [**5 marks**]

SECTION C: (60%)

<u>*Answer TWO Questions from this Section,*</u>

<u>*One of which MUST be Question 5, which is COMPULSORY*</u>

Question 5 (Compulsory)

For each of the following statements define the underlined terms, and then determine whether the statement is **true, false or uncertain** with **a** brief explanation of your answer.
Answer **any five**

(a) All <u>homothetic functions</u> are <u>homogeneous</u> **[6 Marks]**

(b) The diagonal terms of the <u>substitution matrix</u> for a demand system for two goods are always negative whereas the cross-price effects are not always <u>symmetric</u>. **[6 Marks]**

(c) The <u>Lagrangian multiplier</u> in the cost minimization problem is the firm's <u>marginal cost</u>. **[6 Marks]**

(d) The <u>profit-maximization</u> and <u>cost-minimization</u> approaches give same result for given output level. **[6 Marks]**

(e) Every <u>Walrasian Equilibrium</u> allocation is <u>Pareto efficient</u>. **[6 Marks]**

(f) The following <u>Bernoulli utility function</u> $u(x) = \sqrt{x}$ exhibits <u>decreasing absolute risk aversion</u>. **[6 Marks]**

(g) A <u>Bayesian game</u> is a <u>dynamic game with complete information</u>. **[6 Marks]**

(h) Unlike <u>prospect theory</u> gains and losses are given different weights in <u>rational choice theory</u>. **[6 Marks]**

Question 6

A couple (Husband, H and Wife, W) has one small car with a fuel tank capacity of 40 liters which cost $4. The car does not get damaged except through non-use but it uses a minimum of 10 liter on any journey; thereafter, it uses fuel in multiples of 10 liters with a maximum permissible of 30 liters. At the starting point of the game the tank is full. Subsequently, the rules of the game are as follows:

- The wife makes the first move
- Each person must use the car when it is his/her turn
- The person that exhausts the fuel pays the other $4 which could be used to refill the tank or spent in any other way he/she deems fit.

(a) Represent the information in a game tree making sure you explain the players' strategies and sequence of play. **[8 Marks]**

(b) Characterize this game and explain the solution method that is appropriate. **[4 Marks]**

(c) Identify and explain all possible Nash equilibria of the game. **[8 Marks]**

(d) Find the subgame perfect Nash equilibrium if any and explain. **[10 Marks]**

Question 7

There are a large number of sellers and buyers in a used-car market. Each seller has one car to sell. Suppose the quality of a used car can be indexed by θ, which is uniformly distributed on [0,1]. If a seller of type θ sells his car for a price p, he receives utility $u_s(\theta,p)$. A buyer who buys a car of quality at price p receives a utility of $u_b = \theta - p$. If a seller does not sell his car, he receives a utility of zero. Similarly, a buyer who does not buy a car receives a utility of zero. A seller knows the quality of his car, but buyers only know the probability distribution of the quality of the car.

(a) Show that in a competitive equilibrium under asymmetric information $E(\theta|p) = p$.
[6 marks]

(b) Show that if $u_s(\theta,p) = p - \theta/2$, every $p \in (0,1/2]$ is an equilibrium price. **[6 marks]**

(c) Find the equilibrium price when $u_s(\theta,p) = p - \theta^{1/2}$ and what quality of cars are traded in equilibrium?

[6 marks]

(d) Find an equilibrium price when $u_s(\theta,p) = p - \theta^3$ and what quality of cars are traded in equilibrium? **[6 marks]**

(e) Are any of the preceding outcomes Pareto efficient? Explain **[6 marks]**

Question 8

The inverse demand functions for the firms, firm 1 and firm 2, in a duopoly market are given as

$$P_1 = a_1 - b_1 y_1 - cy_2 \qquad \text{and}$$
$$P_2 = a_2 - cy_1 - b_2 y_2$$

where y_1 and y_2 are the outputs of the firms and P_1 and P_2 are their prices respectively.

(a) Derive the direct demand functions and provide an index of product differentiation
[6 marks]

(b) Use the index to establish the conditions for the products of the firms to be considered
(1) Perfect substitutes (2) Independent **[4 marks]**

Suppose that marginal costs are zero

(c) State the objective function of the firm 1 and derive the equilibrium output if the firms are Cournot competitors **[5 marks]**

(d) State the objective function of firm 1 and derive the equilibrium price if the firms are Bertrand competitors **[5 marks]**

(e) Derive the reaction functions of firm 1 for both type of competition and comment on their slopes. **[6 marks]**

(f) In each case, state whether the strategic variables are complements or substitutes
[4 marks]